

Installation Instructions

GAS-FIRED STEAM OR WATER BOILER

bryant

Cancels 39246D1 Rev 1

39246D9

11/15/71

The Bryant Model 246 is a low-pressure, cast-iron sectional boiler designed for use in water or steam heating systems. The design is certified by the American Gas Association for use with natural or propane gas. The type S boiler can be used in steam systems with a maximum working pressure of 15 psig. The type W boiler can be used in water systems with a normal working pressure of 30 psig and is available for systems with working pressures of 50 psig or 100 psig when appropriate gauge and relief controls are used.

All installations are subject to codes established by local utilities or other authorities having jurisdiction. This jurisdiction normally covers electrical wiring, gas piping, flue specification and insulation of adjacent combustible material where required clearances cannot be maintained. As a practical guide, use the American National Standard Installation of Gas Appliances and Piping Z21.30, and Bryant Form No. 39003D1 "Procedure for Gas Appliances".

Read these instructions completely before beginning the installation.

It is recommended that the following step-by-step instructions be followed for best assembly results.

Inspection

Locating the Boiler

Assembling the Base

Assembling the Boiler Sections

Installing the Draft Hood

Manifold and Pilot Header Assembly

Installing Casing Panels

Boiler Header and Piping Installation

Steam and Water Trim Controls

Gas Controls and Main Gas Connections

Electrical Wiring

Flue Connection and Venting

Firing Boiler and Control Adjustment

Servicing

Note: The terms "right-hand" and "left-hand" whenever used in this installation instruction are determined by facing the side of the boiler with the manifold.

INSPECTION

The boiler is shipped knocked down. On the end of the boiler fitting box there is a master copy of all packages required to assemble the boiler. Each box has a package number. Check to be sure all required packages have been received. Also check the rating plate for type of gas, input, voltage, etc., to be sure

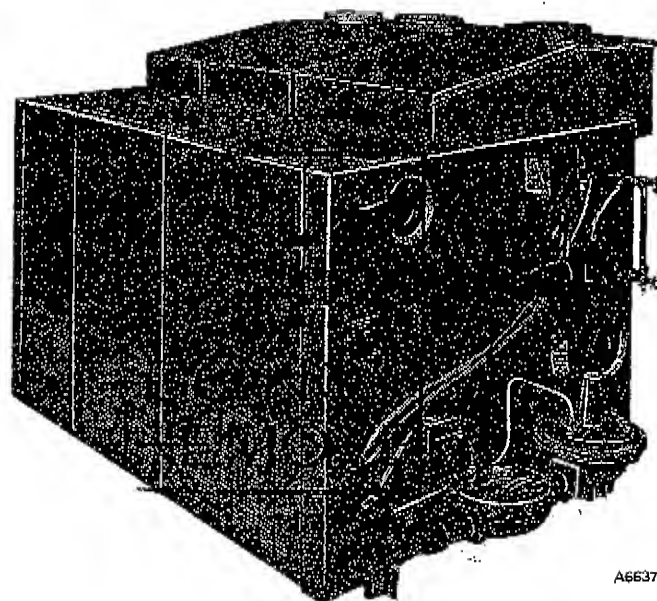


Figure 1 - Model 246 Boiler

that all equipment furnished meets the requirements of the installation. Any lubricant or pipe dope used for gas valve or gas pipe connections, shall be resistant to the action of propane.

LOCATING THE BOILER

The boiler should be centrally located with respect to the distribution system and as close to the chimney as possible.

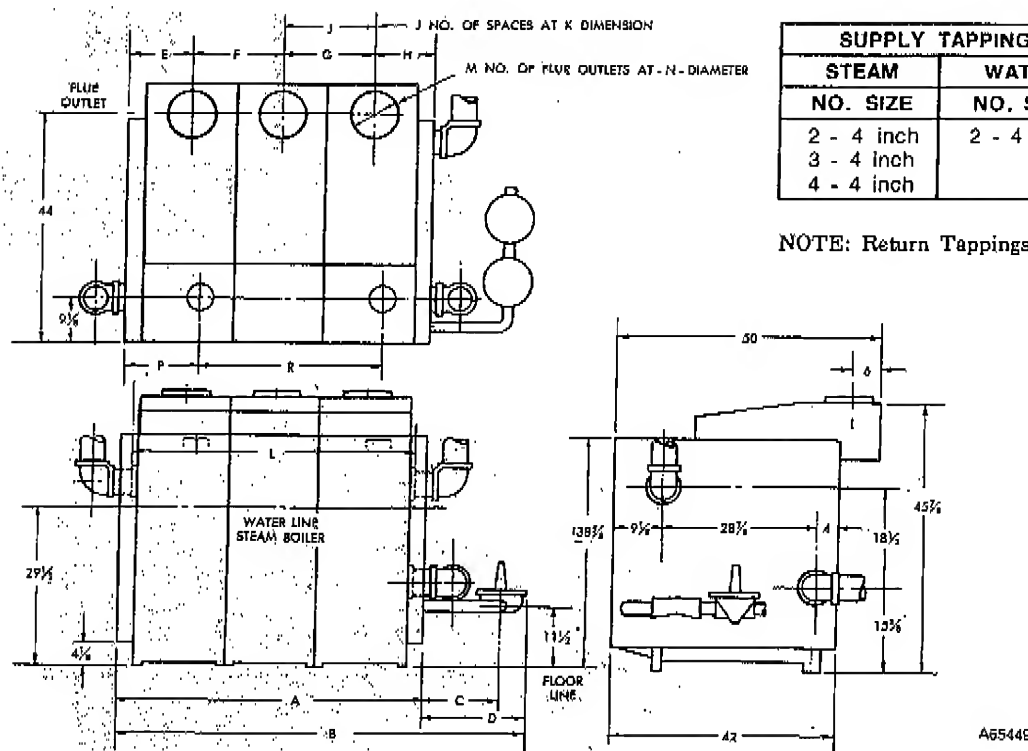
This boiler is not intended for use on combustible floors. When selecting the installation site, remember it must have a firm, noncombustible level foundation. Construct a level concrete pad if necessary. If the boiler base is not level, the sections will not align properly and assembly difficulties will be encountered.

If the Model 246 is to be used as a steam boiler and is to be connected to another steam boiler, the factory design waterlines of the two boilers must be equal distance above floor level.

Combustion Air

APPLIANCES LOCATED IN UNCONFINED SPACES

In unconfined spaces in buildings of conventional frame, brick, or stone construction, infiltration nor-



NOTE: Return Tappings 2 @ 4-inches on all Sizes.

Figure 2 - Dimensional Drawing

TABLE I-DIMENSIONAL DATA

Boiler Size	WIDTH OF BOILER	WIDTH INCLUDING CONTROLS		COVER TO CENTER OF CONTROLS		COVER TO OUTSIDE OF CONTROLS		LEFT SIDE OF COVER TO CENTER OF FLUE OUTLET	DISTANCE BETWEEN FLUE CENTERS			RIGHT SIDE OF COVER TO CENTER OF FLUE OUTLET	NUMBER OF J-SPACES	DISTANCE BETWEEN J-SPACE CENTERS	DISTANCE BETWEEN 4" FLOW OUTLETS	NUMBER OF FLUE OUTLETS	DIAMETER OF FLUE OUTLETS	DISTANCE FROM LEFT SIDE COVER TO CENTER OF RISER	DISTANCE BETWEEN RISER CENTERS	GAS CONNECTION SIZES	
		Prop.	Nat.	Prop.	Nat.	Prop.	Nat.		E	F	G									H	J
4	18-3/4	27-3/8	28-1/8	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	Omit	Omit	9-3/8	Omit	Omit	Omit	18-3/4	1	8	Omit	Omit	1/2	3/4
5	23	31-5/8	32-3/8	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	11-1/2	11-1/2	11-1/2	11-1/2	11-1/2	11-1/2	21	1	9	1	1/2	3/4	
6	27-1/4	36-5/8	38-1/4	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	13-5/8	13-5/8	13-5/8	13-5/8	13-5/8	13-5/8	25-1/4	1	10	1	3/4	1	
7	31-1/2	40-7/8	40-1/2	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	12-3/4	12-3/4	12-3/4	12-3/4	12-3/4	12-3/4	29-1/2	2	10	1	3/4	1	
8	35-3/4	45-1/8	46-3/4	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	14-7/8	14-7/8	14-7/8	14-7/8	14-7/8	14-7/8	34-3/4	2	9	1	3/4	1-1/4	
9	40	49-3/8	53-1/2	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	11-1/2	11-1/2	11-1/2	11-1/2	11-1/2	11-1/2	38	2	9	1	3/4	1-1/4	
10	44-1/4	53-5/8	57-3/4	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	13-1/2	13-1/2	13-1/2	13-1/2	13-1/2	13-1/2	42-1/4	2	10	1	3/4	1-1/4	
11	48-1/2	57-7/8	62-3/8	6-3/4	6-7/8	8-5/8	9-3/8	9-3/8	13-7/8	13-7/8	13-7/8	13-7/8	13-7/8	13-7/8	46-1/2	2	10	1	3/4	1-1/4	
12	52-3/4	63	71-1/2	6	13-3/4	10-1/4	18-3/4	9-3/8	14-7/8	17	11-1/2	17	11-1/2	11-1/2	50-3/4	3	9	1	1-1/2	1-1/2	
13	57	67-1/4	75-3/4	6	13-3/4	10-1/4	18-3/4	9-3/8	11-1/2	17	11-1/2	17	11-1/2	11-1/2	55	3	9	1	1-1/2	1-1/2	
14	61-1/4	71-1/2	80	8	13-3/4	10-1/4	18-3/4	9-3/8	17	21-1/4	13-5/8	17	11-1/2	11-1/2	59-1/4	3	10	1	1-1/2	1-1/2	
15	65-1/2	75-3/4	84-1/2	8	14	10-1/4	19	11-1/2	19-1/8	21-1/4	13-5/8	17	11-1/2	11-1/2	63-1/2	3	10	1	1-1/2	2	
17	74	87	94-3/4	8-3/8	15	13	20-3/4	11-1/2	17	21-1/4	13-5/8	17	11-1/2	11-1/2	72	4	10	1	1-1/2	2	
19	82-1/2	95-1/2	103-1/4	8-3/8	15	13	20-3/4	9-3/8	17	21-1/4	13-5/8	17	11-1/2	11-1/2	80-1/2	4	10	1	1-1/2	2	
21	91	104	111-3/4	8-3/8	15	13	20-3/4	13-5/8	21-1/4	21-1/4	13-5/8	17	11-1/2	11-1/2	89	4	10	54	1-1/2	2	
23	89-1/2	112-1/2	120-1/4	8-3/8	15	13	20-3/4	9-3/8	14-7/8	19-1/8	13-5/8	17	11-1/2	11-1/2	97-1/2	5	10	1	1-1/2	2	
25	108	125-3/4	128-3/4	13-1/4	15	17-3/4	20-3/4	11-1/2	18-1/8	21-1/4	13-5/8	17	11-1/2	11-1/2	108	5	10	49-3/4	1-1/2	2	
27	116-1/2	134-1/4	137-1/2	13-1/4	15	17-3/4	21	9-3/8	12-3/4	17	13-5/8	17	11-1/2	11-1/2	114-1/2	6	10	58-1/4	1-1/2	2-1/2	
29	125	142-3/4	146-1/2	13-1/4	15	17-3/4	21-1/2	9-3/8	13	21-1/4	13-5/8	17	11-1/2	11-1/2	123	6	10	56-3/4	1-1/2	2-1/2	
31	133-1/2	152-1/4	155	14-1/4	15	18-7/8	21-1/2	13-5/8	21-1/4	21-1/4	13-5/8	17	11-1/2	11-1/2	131-1/2	6	10	32-3/4	1-1/2	2-1/2	
33	142	160-1/4	163-1/2	14-1/4	15	18-7/8	21-1/2	13-5/8	21-1/4	21-1/4	13-5/8	17	11-1/2	11-1/2	140	7	10	31-1/4	1-1/2	2-1/2	

ally is adequate to provide air for combustion, ventilation, and draft hood dilution.

If the unconfined space is within a building of unusually tight construction, air for combustion, ventilation, and draft hood dilution shall be obtained from outdoors or from spaces freely communicating with the outdoors. Under these conditions a permanent opening or openings having a total free area of not less than one square inch per 5,000 Btuh of total input rating of all appliances shall be provided. Ducts used to convey makeup air from the outdoors shall be of the same cross-sectional area as the free

area of the openings to which they connect. Such ducts connected to the outside air only may be connected to the cold air return of the heating system. The minimum dimension of rectangular air ducts shall be not less than 3 inches.

All air from inside building:

The confined space shall be provided with two permanent openings, one near the top of the enclosure and one near the bottom. Each opening shall have a free area of not less than one square inch per 1,000 Btuh of the total input rating of all appliances in the enclosure, freely communicating with interior areas having in turn adequate infiltration from the outside.

TABLE II - PERFORMANCE DATA

Boiler Size	Ratings—Natural & Propane Gas (1)				Net Ratings (2)			Water Capacity Gallons		Gross Horsepower Output (3)
	Input Btuh	Gross Output			Btuh	Steam Sq Feet	Water Sq Feet	Entire Boiler	To Water Line	
		Btuh	Steam Sq Feet	Water Sq Feet						
4	315,000	252,000	1,050	1,680	189,000	788	1,260	27.3	18.8	7.52
5	420,000	336,000	1,400	2,240	252,100	1,050	1,680	33.7	23.2	10.03
6	525,000	420,000	1,750	2,800	315,100	1,313	2,100	40.1	27.6	12.54
7	630,000	504,000	2,100	3,360	378,100	1,575	2,520	46.5	32.0	15.05
8	735,000	588,000	2,450	3,920	441,100	1,838	2,940	52.9	36.4	17.55
9	840,000	672,000	2,800	4,480	504,100	2,101	3,360	59.3	40.8	20.06
10	945,000	756,000	3,150	5,040	567,100	2,363	3,780	65.7	45.2	22.57
11	1,050,000	840,000	3,500	5,600	630,200	2,626	4,200	72.1	49.6	25.07
12	1,155,000	924,000	3,850	6,160	693,200	2,888	4,620	78.5	54.0	27.58
13	1,260,000	1,008,000	4,200	6,720	756,200	3,151	5,040	84.9	58.4	30.09
14	1,365,000	1,092,000	4,550	7,280	819,200	3,413	5,460	91.3	62.8	32.60
15	1,470,000	1,176,000	4,900	7,840	882,200	3,676	5,880	104.1	71.6	35.10
17	1,680,000	1,344,000	5,600	8,960	1,015,100	4,230	6,767	116.9	80.4	40.12
19	1,890,000	1,512,000	6,300	10,080	1,155,100	4,813	7,700	129.7	89.2	45.13
21	2,100,000	1,680,000	7,000	11,200	1,295,300	5,397	8,635	142.5	98.0	50.15
23	2,310,000	1,848,000	7,700	12,320	1,432,600	5,969	9,550	155.3	106.8	55.16
25	2,520,000	2,016,000	8,400	13,440	1,565,200	6,522	10,435	168.1	115.6	60.18
27	2,730,000	2,184,000	9,100	14,560	1,695,700	7,065	11,305	180.9	124.4	65.19
29	2,940,000	2,352,000	9,800	15,680	1,826,100	7,609	12,175	193.7	133.2	70.21
31	3,150,000	2,520,000	10,500	16,800	1,956,500	8,152	13,045	206.5	142.0	75.22
33	3,360,000	2,688,000	11,200	17,920	2,087,000	8,696	13,913	219.3	150.8	80.24

(1) All ratings for sea level to 2,000 feet. For altitudes over 2,000 feet, reduce all ratings by 4% for each 1,000 feet above sea level.

(2) Selection factors providing for piping and pickup are those recommended by I.B.R.

(3) Ratings are based on 33,500 Btuh per horsepower.

Note: Units may be twinned, back-to-back, to provide units to 6,720,000-Btuh input.

All air from outdoors:

The confined space shall be provided with two permanent openings, one in or near the top of the enclosure and one in or near the bottom. The openings shall communicate directly, or by means of ducts, with outdoors or to such spaces (crawl or attic), that freely communicate with outdoors.

When directly communicating with outdoors, or by means of vertical ducts, each opening shall have a free area of not less than 1 sq in. per 4,000 Btuh of total input rating of all appliances in the enclosure. If horizontal ducts are used, each opening shall have a free area of not less than 1 sq in. per 2,000 Btuh of total input of all appliances in the enclosure.

Ducts shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be not less than 3 inches.

Minimum clearance from combustibles is 6 inches on all sides including the top and draft diverter. Check local boiler codes to see if this distance conforms to their requirements.

It is recommended that a minimum clearance of 24 inches be maintained in front and on the control end of the boiler for servicing.

ASSEMBLING THE BASE

The 4-, 5- and 6-section boilers each have individual bases. The 4-section base has 6 burners, the 5-section base has 8 burners, and the 6-section base has 10 burners.

To assemble any boiler larger than 6 sections some combination of the above three bases must be used. Follow Table III in order for the gas manifold header piping to fit.

The bases are fastened together with 5/16-inch cap screws and nuts. Install two screws in the front posts

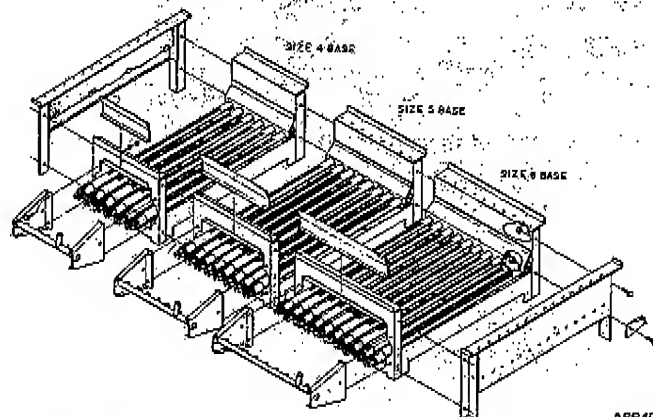


Figure 3 - Boiler Bases Size 4, 5, & 6

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TABLE III

Boiler Size No. of Sections	Number of Bases	Number of Burners* Per Base-Left-to-Right
4	1	6
5	1	8
6	1	10
7	2	6-6
8	2	6-8
9	2	8-8
10	2	8-10
11	2	10-10
12	3	6-8-8
13	3	8-8-8
14	3	6-10-10
15	3	8-10-10
17	4	8-8-8-8
19	4	6-10-10-10
21	4	10-10-10-10
23	5	6-8-10-10-10
25	5	8-10-10-10-10
27	6	6-6-10-10-10-10
29	6	6-10-10-10-10-10
31	6	10-10-10-10-10-10
33	7	6-8-10-10-10-10-10

*Reverse base order if controls are on the left end.

and two in the rear posts as shown in Figure 4. Make sure the back casing supports are mounted on each base as shown in Figure 4.

After the bases are fastened together, install the end closing plates and the two back corner casing supports. See Figure 5. The end closing plate is fastened to the base by four 5/16-inch cap screws.

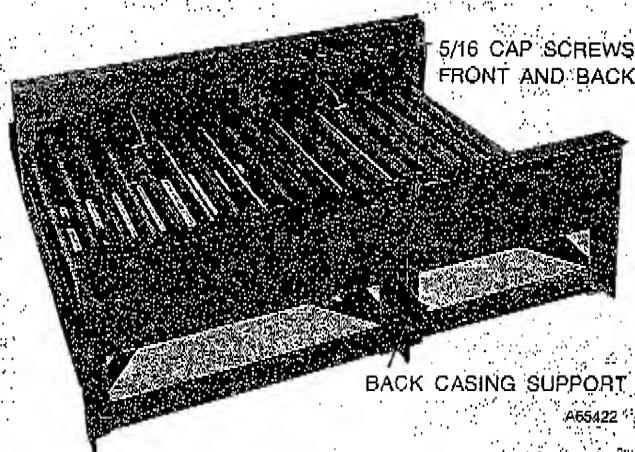


Figure 4 - Rear View of Boiler Bases

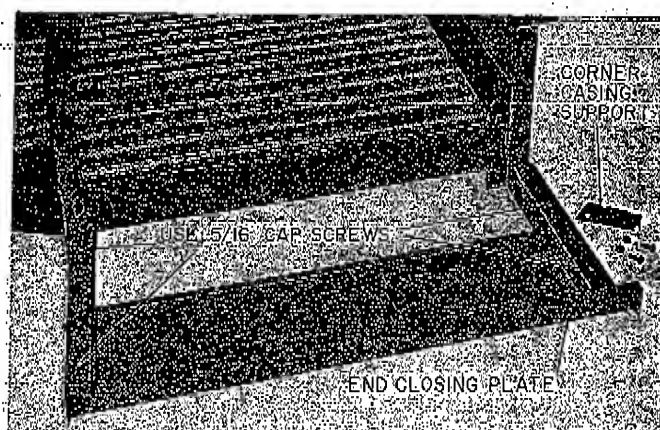


Figure 5 - Installing End Closing Plate

ASSEMBLING THE BOILER SECTIONS

Steam Risers

Steam risers are not required on small sized boilers. On boiler sizes 21 through 29, one riser is required. On boiler sizes 31 and 33, two riser sections are required. Refer to Figure 6 and Table IV for specific locations.

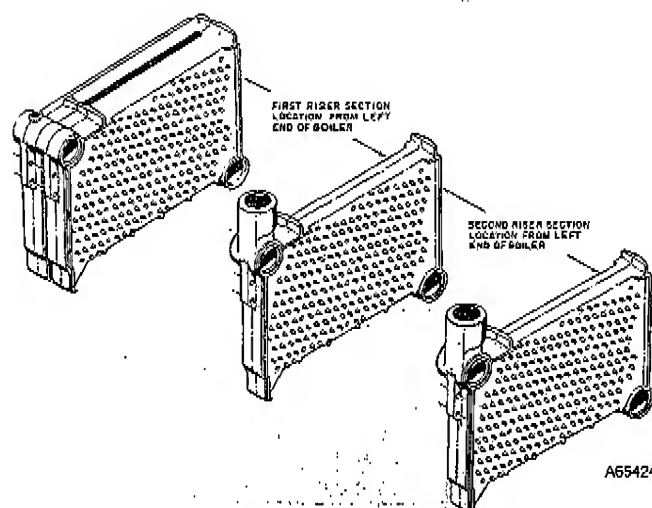


Figure 6 - Steam Riser Section Location

TABLE IV

Boiler Size	*First Riser Section Location from Left End of Boiler	*Second Riser Section Location from Left End of Boiler
21	13th	none
23	15th	none
25	12th	none
27	14th	none
29	16th	none
31	13th	23rd
33	10th	25th

*Locations must be held; otherwise, the top cover would not fit properly.

Start the assembly with a left end battery. A battery consists of two sections factory assembled. Make sure the first battery is lined up even with the left end of the base. See Figure 7.

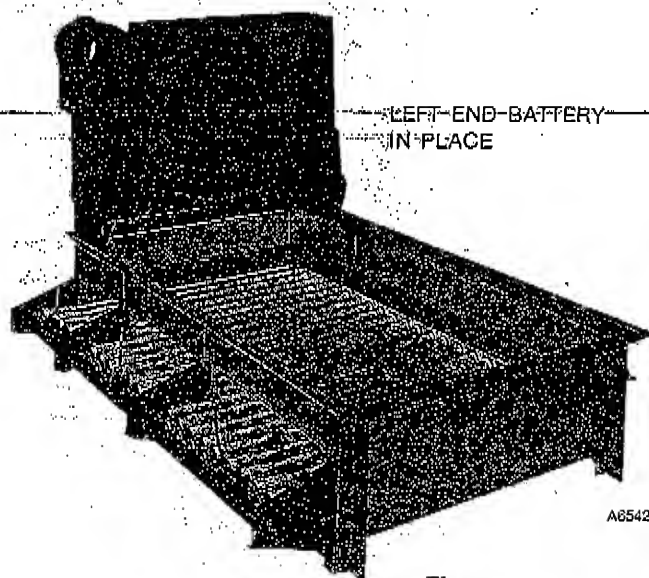


Figure 7

Boiler sections should be assembled on the base so they follow close to the flange on the front of the base in order that the outer casing will fit properly.

Clean both nipple ports on the left end battery and coat them with the red lead furnished. Clean and coat two nipples with red lead; then tap the nipples into the ports making sure they are square with the section. See Figure 8.

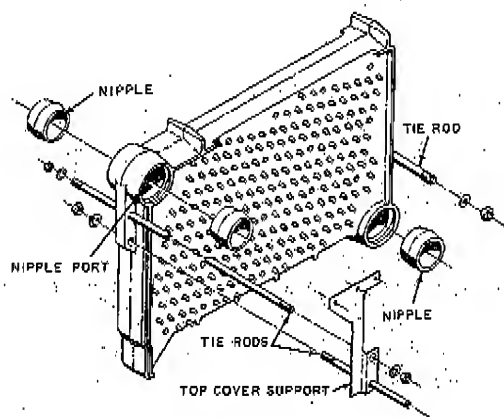


Figure 8

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Set the intermediate battery on the boiler base and clean and coat the nipple ports; then slide it up to the first battery. A pair of manual pull-up tools or the hydraulic assembly tool must be used to pull the batteries together.

The following instructions are for the manual pull-up tool only. See Figure 9. If the hydraulic assembly tool is used, order installation instruction number 39246D6.

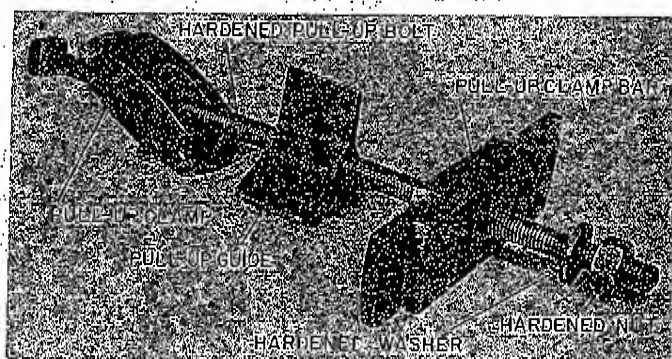


Figure 9

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To use the manual pull-up tools:

1. Insert one pull-up clamp and bolt through front nipple port of intermediate battery until it is beyond the nipple of left end battery. Insert second pull-up tool in rear nipple port in same manner. See Figure 10.

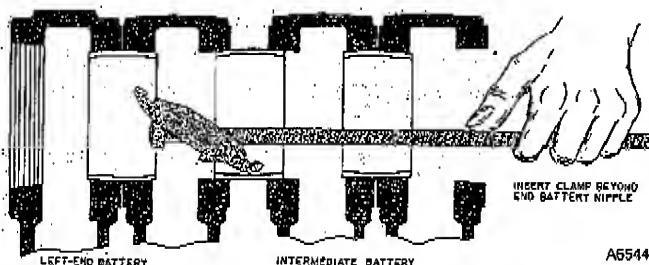


Figure 10

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2. Place pull-up guide on bolt and slide into position next to clamp. This centers clamp in port and causes it to assume a right-angle position with pull-up bolt. See Figure 11.

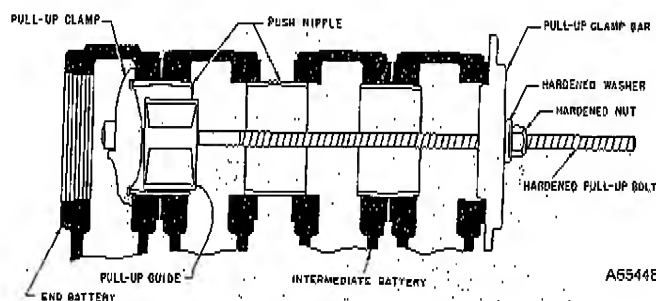


Figure 11

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3. Place pull-up clamp bar on pull-up bolt and against face of nipple port. Place film of oil on pull-up bolt before putting nut and washer on.

4. Before tightening nut, jiggle pull-up tool to make sure both clamp and clamp bar are properly positioned.

5. Work alternately with one pull-up tool and then other so batteries can be drawn up uniformly. When metal-to-metal contact is made around both upper and lower nipple ports, pull-up is complete. Do not pull up beyond this point.

6. Remove pull-up tools by removing nut, washer, and clamp bar; then with a wire hook, remove guide and tilt clamp so tool can be removed from nipple port.

Continue to add batteries in the above manner until the assembly is complete, then insert tie rods in the section lugs matching the length of the tie rod with the base.

On multiple base boilers, insert the top cover supports between the lug nuts and washers directly above the joints in the bases. Fasten the tie rods in place with the flat washers, lockwashers, and nuts furnished. See Figure 12.

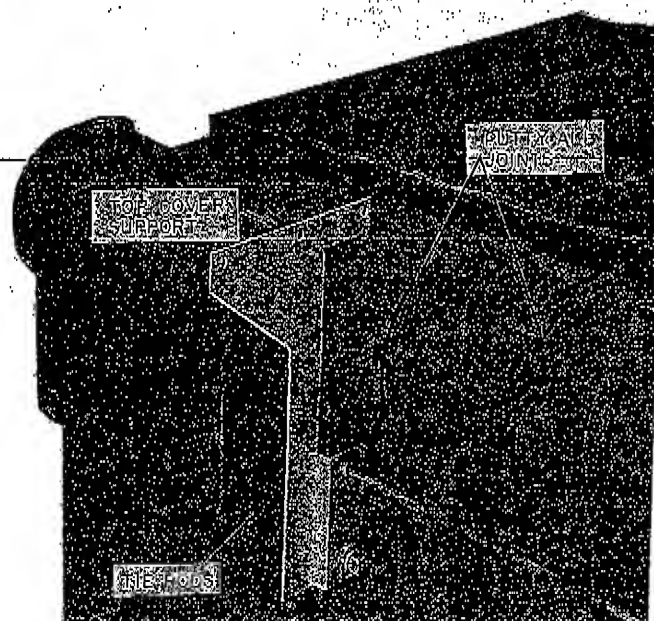


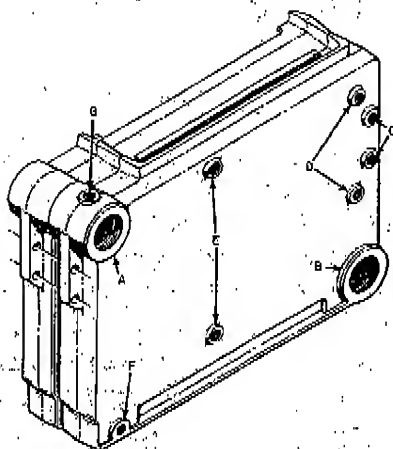
Figure 12

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Apply boiler putty at the junction of all batteries, front, back, and top. Putty should also be applied around the sections where they join the base.

Hydrostatic test the boiler in accordance with applicable codes:

- Plug all openings with exception of an air vent in top of one end section, such as tapping G in Figure 13.
- Fill boiler with water until it runs out of air vent; then plug air vent.
- Check for water leaks before continuing assembly.

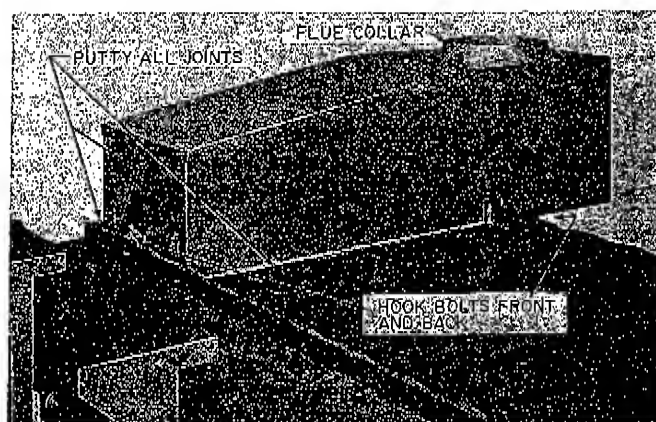


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Figure 13 - Tappings in End Section for Steam and Water Controls

TABLE V

Opening	Size	Steam	Water
A	4 inch	Supply	Supply
B	4 inch	Return	Return
C	1/2 inch	Tri. Cocks	Plugged
D	1/2 inch	LW cutoff and/or gauge glass or 47-2 feeder	Plugged
E	1 inch	LW cutoff and 51-2 feeder combination	Plugged
F	3/4 inch	Drain	Drain
G	1/2 inch	Plugged	Limit control on outlet of Boiler. Temp-Air-gauge on opposite end of Boiler.



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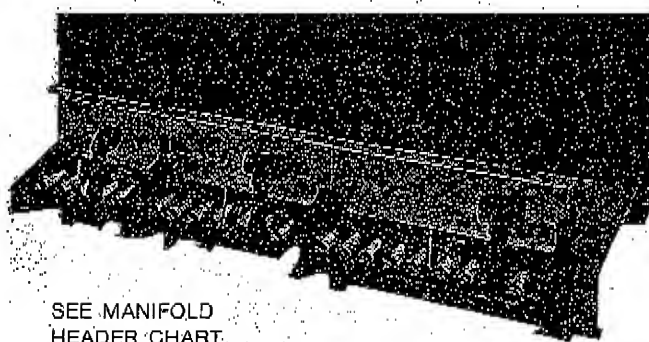
Figure 14

Note: Additional flue collar adapters will be shipped in the fitting package. These adapters, in 9- and 10-inch sizes, are used to standardize the vent pipe where more than one flue collar size is used on the same boiler.

MANIFOLD AND PILOT HEADER ASSEMBLY

When assembling boiler sizes 4, 5, or 6, follow steps 1 and 2 listed below. On boiler sizes 7 through 33, refer to the manifold header chart. For the placing of various lengths of pipe and fittings, follow steps 1 through 7:

- Starting from end of boiler opposite controls, dope a 1-by 4-inch vertical nipple and place in inlet of manifold; tighten securely. See Figure 15.



SEE MANIFOLD
HEADER CHART
FOR NIPPLE SIZES

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Figure 15

INSTALLING THE DRAFT HOOD

The draft diverter comes completely assembled and packaged in individual draft hood packages. The draft diverters are the same size as the boiler bases. To assemble the draft hood, see Figure 14.

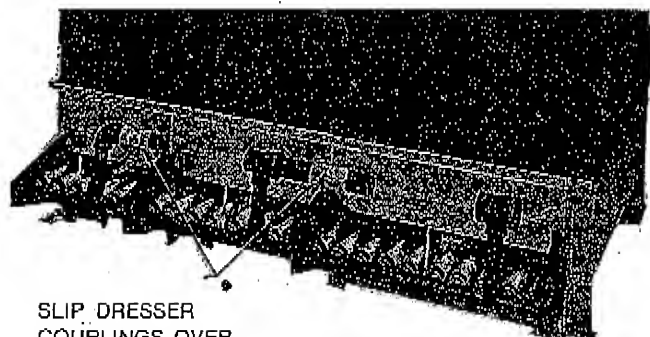
- Apply boiler putty to top of boiler section before mounting draft hood assembly.
- Place draft hood assembly on boiler section, making sure there is enough boiler putty between boiler section and draft hood to assure a tight seal on sides and ends.
- Fasten draft hood securely with hook bolts, washers, and nuts furnished.

- Add an elbow and tighten securely so inlet is parallel to manifold. Install horizontal nipple G specified by manifold header chart.
- On boiler sizes 7 through 33, continue manifold installation by installing appropriate horizontal nipple G as specified in manifold header chart, into first elbow.
- Slip specified dresser coupling on nipple. See Figure 16.
- Install next vertical nipple-and-tee combination as indicated in manifold header chart. Tighten tee so outlet lines up with previously installed horizontal

nipple and dresser coupling; install specified horizontal nipple H in outlet side of tee.

6. **IMPORTANT** - Center slip-on type dresser coupling over space between two horizontal nipples and tighten securely. See Figure 17.

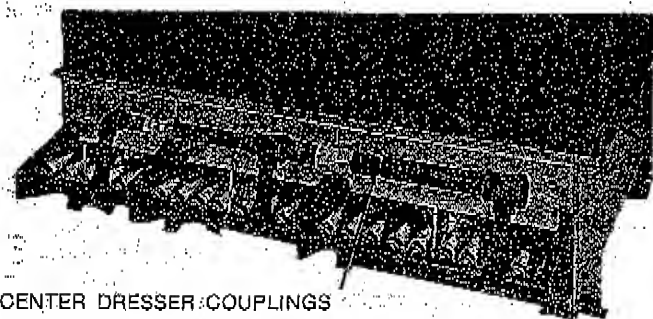
7. Repeat above procedure until the manifold assembly is complete. When completely assembled, manifold should end with a horizontal nipple extending beyond the base.



SLIP DRESSER
COUPLINGS OVER
NIPPLES

A65432

Figure 16



CENTER DRESSER COUPLINGS
OVER SPACE BETWEEN NIPPLES

A65433

Figure 17

Pilot Header Connections

Each boiler base has one pilot. The pilots are assembled in each base at the factory and are located as follows:

- 6 burner base - 3rd burner from right
- 8 burner base - 4th burner from right
- 10 burner base - 5th burner from right

On all boilers of two or more bases, the pilots must be connected by a tube header consisting of the following size:

- Propane gas - 1/4-inch tube for all sizes.
- Natural gas - 1/4-inch tube up to boiler size 23;
3/8-inch tube on boiler sizes 23 through 33.

To assemble pilot header:

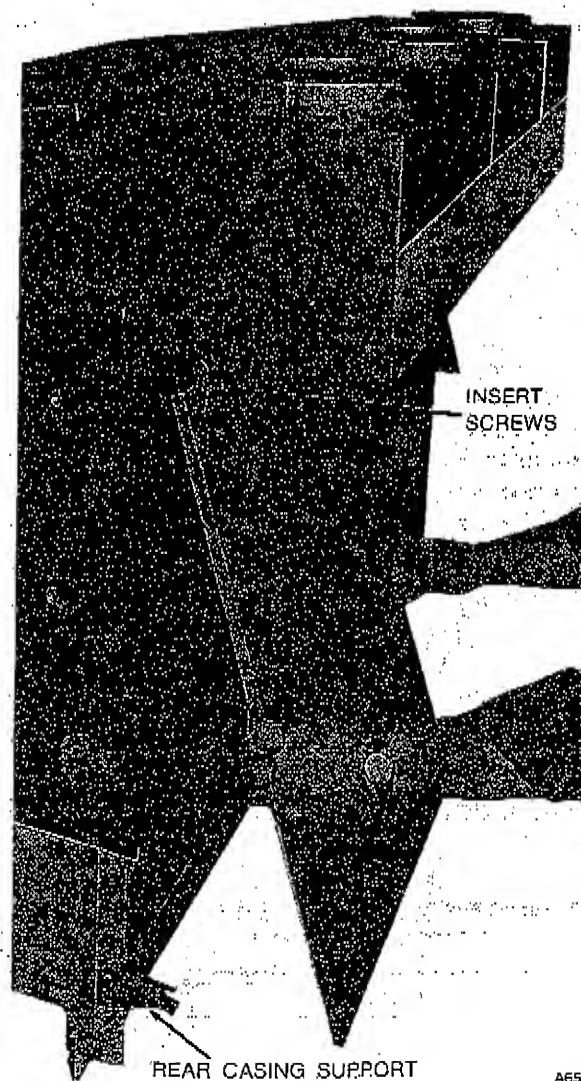
1. Install elbow to pilot tube on base opposite control end.
2. Run pilot tube along manifold header connecting each pilot to tube with a tee.
3. Continue this procedure to complete pilot header assembly, then tape pilot tubing to bottom of manifold header.

NOTE: On natural gas, some utilities require a pilot filter. Check with your local utility.

INSTALLING CASING PANELS

To install the casing panels:

1. Place top of back casing panels under flange on draft diverter baffle and bottom of back casing panels into rear casing supports. See Figure 18.



REAR CASING SUPPORT

A65434

Figure 18

2. Place screws through flange of draft diverter into back casing panel.

3. Position end casing panels by placing bottom rear corner flange in slot of rear casing support.

4. Place screws into end panel through holes provided in draft diverter and manifold bracket.

5. Install rating plate (2 pieces) on end panel where controls will be located.

6. For steam boilers, attach water line plate in factory punched holes in panel behind glass gauge on control end of boiler.

7. Fasten top cover to end of casing panels with two screws and nuts, furnished. On boiler sizes 7 and above, a top cover support is supplied and installed on tie rods as shown in Figure 19.



A85435

Figure 19

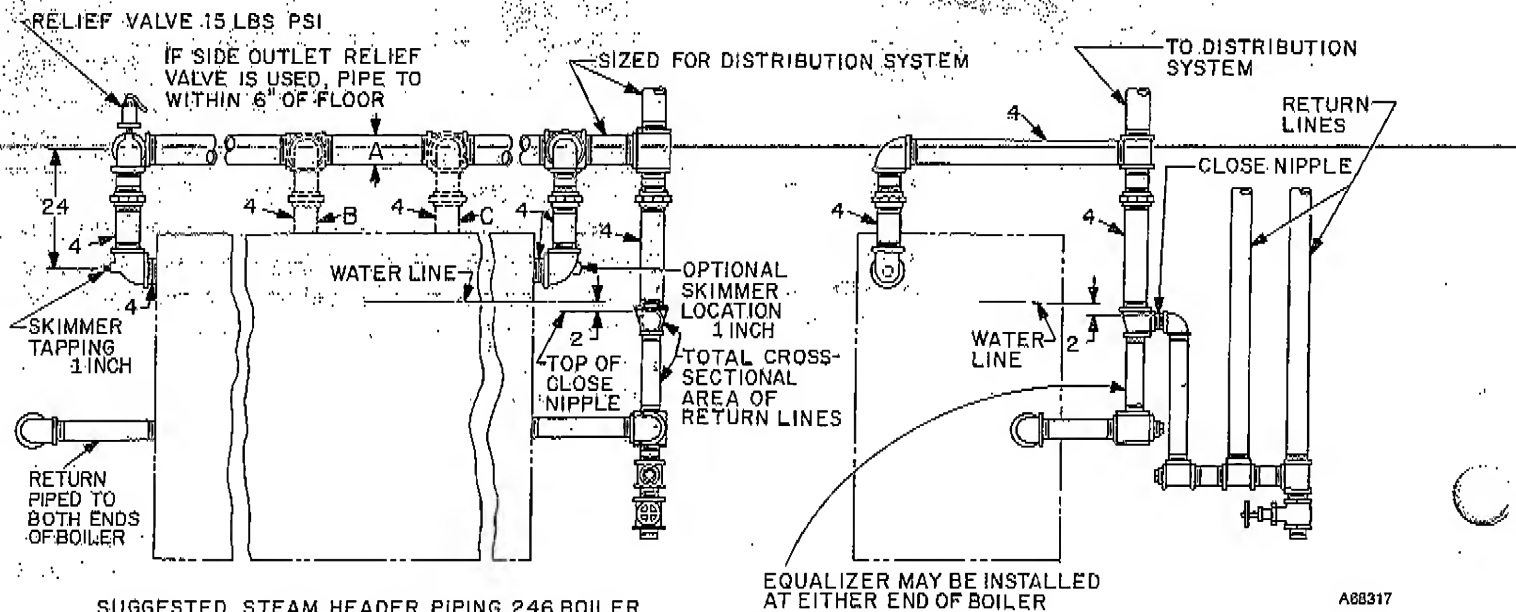
Adjust draft hood clips and top cover supports on tie rods so top covers line up with end panels and front covers are even across top and front. Tighten nuts on tie rods and screws holding top covers to top supports so top covers are held firmly in place.

BOILER HEADER AND PIPING INSTALLATION

Complete the boiler piping (water or steam lines), paying particular attention to the following recommendations for steam boilers.

1. Return must be piped to both ends of boiler.

Boiler Size	Dimension A
4 through 19*	4 inches
21 through 29	6 inches
31 and 33	8 inches



SUGGESTED STEAM HEADER PIPING 246 BOILER

Figure 22

2. Minimum steam header proportions should be as shown in Figure 22.

3. Add skimmer tee as shown in Figure 22.

Note: Never install a shutoff or steam valve between the pressure relief valve and the boiler.

On low-pressure boilers, the ASME Code requires that a pressure relief valve be installed. The valve discharge capacity in pounds per hour must be at least equal to the output of the boiler. The capacity of the boiler in pounds of steam per hour can be determined by dividing the boiler output in Btuh by 1000. For power or process purposes, use the following formula:

$$\frac{\text{input}}{1333} = \text{equals pounds of steam per hour}$$

STEAM AND WATER TRIM CONTROLS

Steam Controls

The steam controls for boiler installation consist of the following components. See Figures 23 and 25.

1. Low-water cutoff (mounted externally) with blow-off valve.
2. High-pressure limit control.
3. Compound pressure-vacuum gauge.
4. Water gauge glass set.
5. Siphon.
6. 15-psig pressure relief valve.

*The 4, 5, & 6 section 246 may be piped with a single riser if the cross-sectional area of the existing steam supply system is not more than the single 4-inch riser area from the boiler.

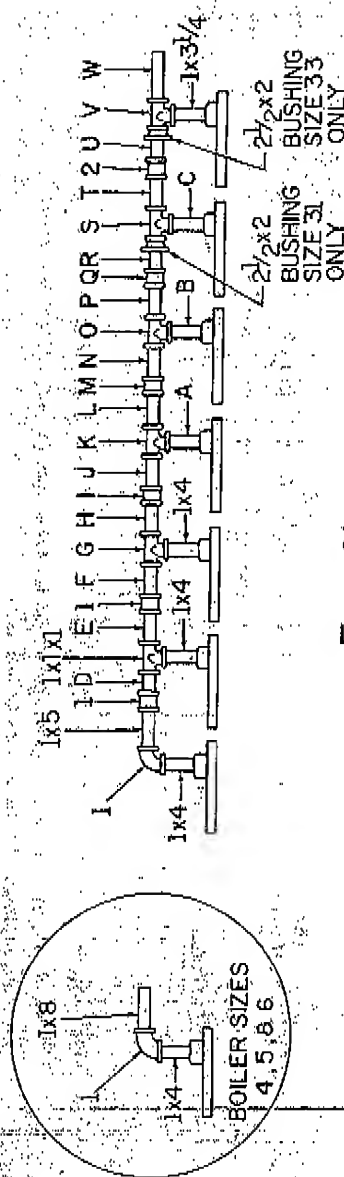


Figure 21

X68320

Table VII-Manifold Header Data (Propane Only)

BOILER SIZE	NIPPLE A	NIPPLE B	NIPPLE C	NIPPLE D	NIPPLE E	NIPPLE F	TEE FITTING G	NIPPLE H	DRESSER COUPLING I	NIPPLE J	TEE FITTING K	NIPPLE L	DRESSER COUPLING M
7				1x 5	1x8								
8				1x 9-1/4	1x8								
9				1x 9-1/4	1x8								
10				1x13-1/2	1x8								
11				1x13-1/2	1x8								
12				1x 9-1/4	1x5	1x 9-1/4	1 x1x1	1 x8					
13				1x 9-1/4	1x5	1x 9-1/4	1 x1x1	1 x8					
14				1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x8					
15				1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x8					
17	1x4			1x 9-1/4	1x5	1x 9-1/4	1 x1x1	1 x5	1	1 x 9-1/4	1 x1	1 x8	
19	1x4			1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x8	
21	1x4			1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x8	
23	1x4	1x4		1x 9-1/4	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x5	1
25	1x4	1x4		1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x5	1
27	1x4	1x4		1x 5	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x5	1
29	1x4	1x4		1x13-1/2	1x5	1x13-1/2	1 x1x1	1 x5	1	1 x13-1/2	1 x1	1 x5	1
31	1x3-3/4	1x3-1/2	1x3-1/4	1x13-1/2	1x5	1x13-1/2	1-1/4x1x1	1-1/4x9-1/4	1-1/4	1-1/4x 9-1/4	1-1/2x1-1/4x1	1-1/2x7	1-1/2
33	1x3-3/4	1x3-1/2	1x3-1/2	1x 9-1/4	1x5	1x13-1/2	1-1/4x1x1	1-1/4x9-1/4	1-1/4	1-1/4x 9-1/4	1-1/2x1-1/4x1	1-1/2x7	1-1/2

BOILER SIZE	NIPPLE N	TEE FITTING O	NIPPLE P	DRESSER COUPLING Q	NIPPLE R	TEE FITTING S	NIPPLE T	NIPPLE U	TEE FITTING V	NIPPLE W
23	1 x13-1/2	1 x1	1 x 8							
25	1 x13-1/2	1-1/4x1	1-1/4x13							
27	1 x13-1/2	1 x1	1 x 5	1	1 x13-1/2	1-1/4x1	1-1/4x13			
29	1 x13-1/2	1-1/4x1	1-1/4x 9-1/4	1-1/4	1-1/4x 9-1/4	1-1/4x1-1/4x1	1-1/4x13			
31	1-1/2x1-1/4	2 x1-1/2x1	2 x 8-1/2	2	2 x 8-1/2	2-1/2x2-1/2x1	2-1/2x13			
33	1-1/2x1-1/4	2 x1-1/2x1	2 x 8-1/2	2	2 x 9-1/2	2 x2	2 x 8-1/2	2x8-1/2	2-1/2x2-1/2x1	2-1/4x13

NOTE: To change gas controls to left end of boiler, change the lengths of the horizontal nipples and reverse all nipples between tees and manifold.

NOTE: All nipples connected to dresser couplings are threaded one end only.

Water Controls

The water controls for the boiler consist of three components:

1. Water temperature high-limit control (electric).
2. Combination temperature-pressure-altitude gauge.
3. Pressure relief valve (must be piped to suitable drain).

Install temperature-pressure-altitude gauge in the tapping indicated in Figure 13. Remove the glass cover of the gauge and manually set inner pointer to indicate the vertical height from the gauge to the highest point in the piping system.

Boiler with Refrigeration System

When the boiler is used in connection with a refrigeration system, it must be installed so that the chilled medium is piped in parallel with the heating boiler, with appropriate valves to prevent the chilled medium from entering the heating boiler. An example of such piping is shown in Figure 24.

When the boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, the boiler piping system must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

Note: It is recommended that a relief valve be installed between valve A and the boiler or valve B and the boiler. This relief valve will protect the boiler from expansion pressures during the cooling season.

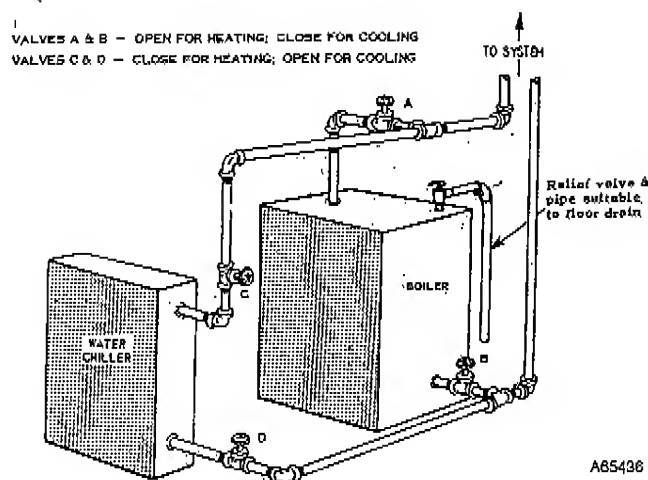


Figure 24 - Refrigerant Diagram

D4 Gas Controls

732 Automatic Pilot:

The pilot assembly includes a normally open switch wired in series with the Bryant automatic gas control valve. The switch is at the free end of the monometal element, assembled so that the fixed end is positioned at the pilot flame. Heat applied to the fixed end of the monometal element causes the free end to move. This closes the switch and completes the electrical circuit to the control valve. The circuit will close within one minute. It will remain closed as long as there is normal pilot flame. While closed, the boiler is under the direct automatic control of the room thermostat or other operating control as long as the main manual gas shutoff valve is open. If the pilot flame goes out for any reason, the monometal element will cool and the free end will move back to its original position. This breaks the electric circuit and the Bryant automatic gas control valve will close. This shuts off the gas supply to the main burner.

Bryant Automatic Gas Control Valve:

The Bryant gas control valve operates on the principle of differential pressure on either side of a flexible diaphragm which divides the main body of the valve into two compartments. The lower compartment is under constant pressure from the gas supply line. Gas pressure to the upper compartment is controlled by a small valve actuated by an electric heat motor. The control valve allows gas to flow to or from the upper compartment.

The electric heat motor is connected into the 24-Volt control circuit with the room thermostat or other boiler operating controls. When there is a call for heat, the control valve closes the supply port to the upper compartment and allows the gas above the diaphragm to bleed off through an escapement to the pilot.

The supply pressure on the bottom then pushes the diaphragm up and gas flows to the main burners.

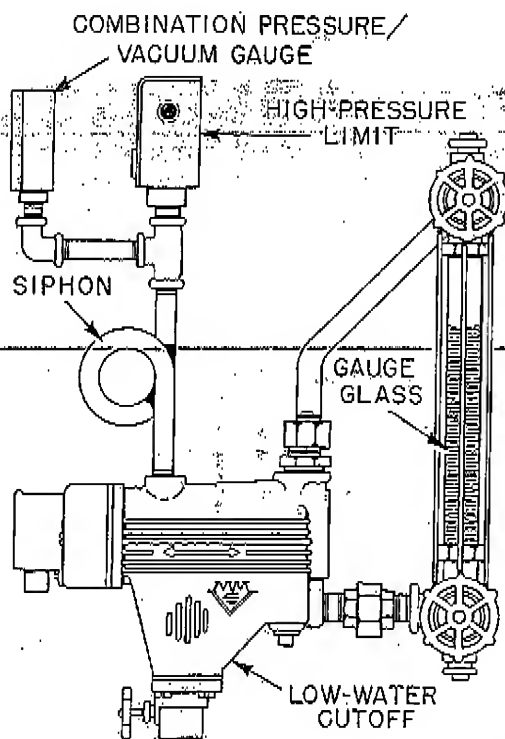


Figure 23 - Steam Controls

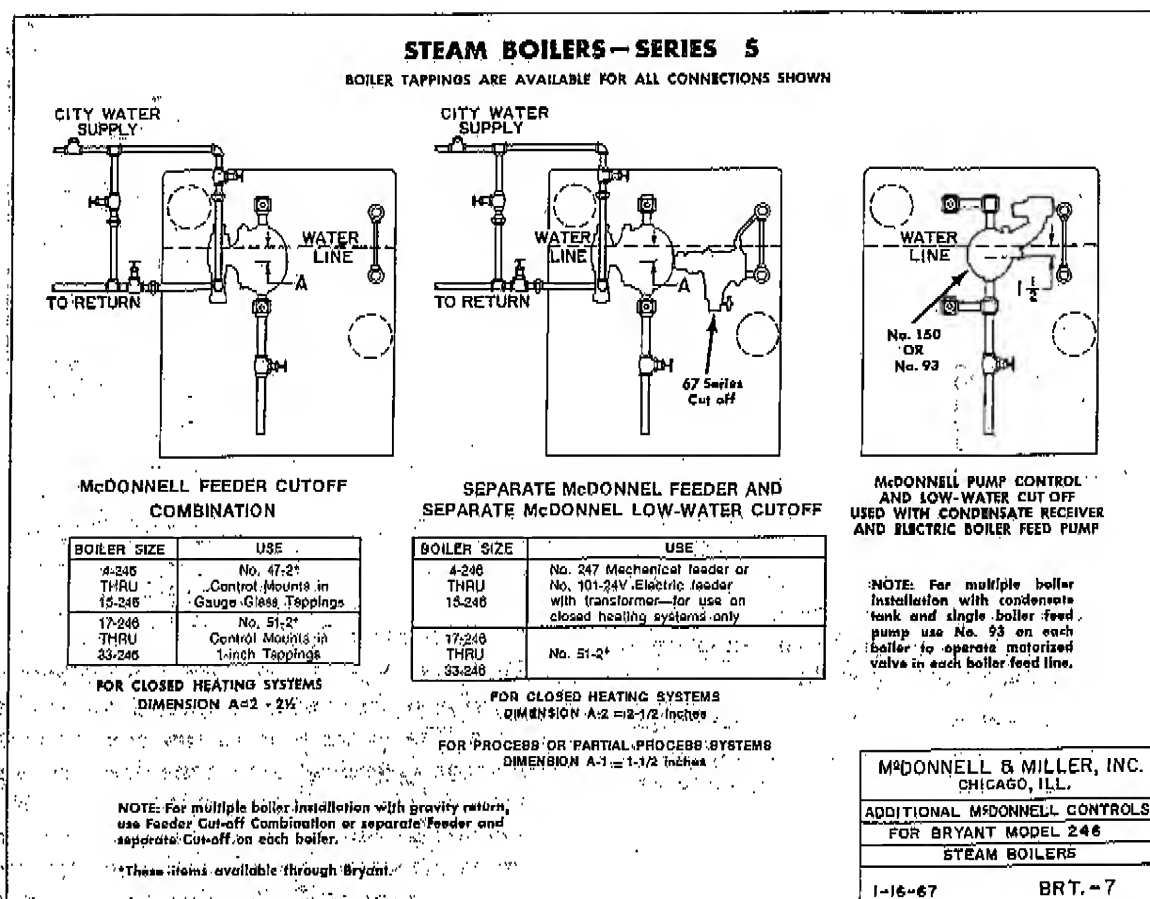


Figure 25

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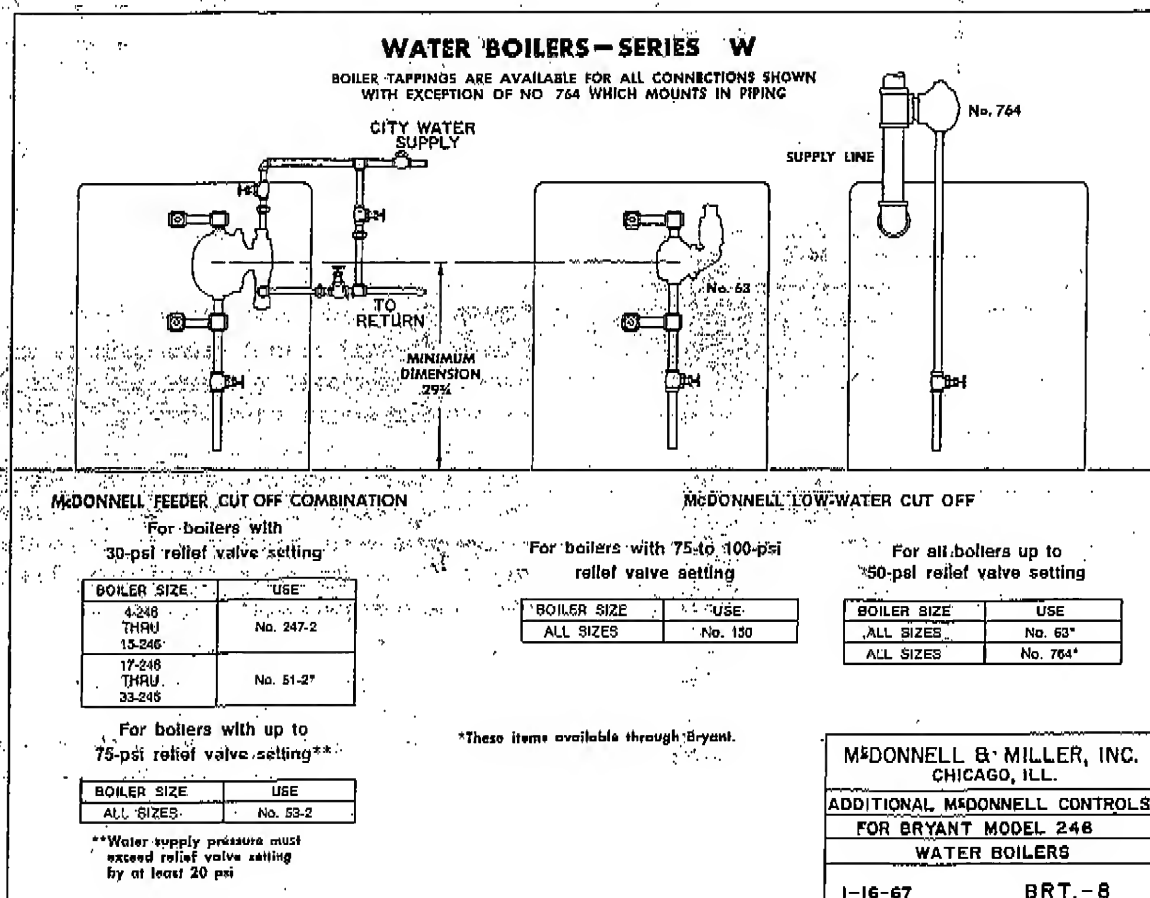


Figure 26

A65483

When the operating control or room thermostat is satisfied, the control valve closes the escapement and opens the supply port to allow gas pressure to build up on top of the diaphragm. When the pressure above and below the diaphragm is equal, a spring or weight reseats the diaphragm and the main gas flow is shutoff.

Additional force (spring or weight) is applied to the upper side of the diaphragm to ensure that no gas will flow to the burners unless there is sufficient pressure differential.

Gas Pressure Regulator:

The regulator contains a flexible diaphragm which operates a valve. With no gas flow, the valve is wide open. As gas is supplied and the pressure increases, the diaphragm is pushed up against the force of a spring until the gas pressure and spring force are equal. The valve has now been pulled up, blocking some of the gas supply, resulting in constant pressure gas at the burner. Any fluctuations will cause the valve to be repositioned, thus keeping the pressure constant.

TABLE VIII-Gas Controls and Main Gas Connections

Control Type	Gas Type	Boiler Type	Control Components
D2 100% shutoff 24 Volt Thermocouple pilot	Propane	Water & Steam	1. 100% pilot shutoff relay 2. Thermocouple pilot 3. Transformer 4. Bryant automatic gas valve or controller
D4 24 Volt Bryant pilot	Natural	Water & Steam	1. Bryant automatic pilot 2. Bryant automatic gas valve or controller 3. Gas pressure regulator 4. Transformer
D5 100% shutoff 24 Volt Thermocouple pilot	Natural	Water & Steam	1. 100% pilot shutoff relay 2. Thermocouple pilot 3. Transformer 4. Bryant automatic gas valve or controller 5. Gas pressure regulator
D6 (4, 5, & 6 size only) 750 Millivolt Thermopile pilot	Natural	Water & Steam	1. Thermopile pilot 2. 750-Millivolt automatic gas valve 3. Gas pressure regulator

Note: There are four gas control types used on the Model 246 Boiler. The D4, D5, and D6 controls are used on natural gas; the D2 controls are used for propane gas only.

D2 and D5 Gas Controls

The D2 and D5 gas controls have pilots equipped with thermocouple elements. The pilot flame should surround the thermocouple and extend downward to include 3/8 to 1/2 inch of the tip. The flame must not come in contact with any other part of the thermocouple.

Each pilot is connected to a 100% shutoff combination valve and relay. See Figure 27. The thermocouple transforms heat energy from the pilot flame into electrical energy to operate the valve and relay. When there is a pilot flame, the current generated by the thermocouple holds the 100% shutoff valve in the open position, allowing gas to flow to the pilot. The relay in the valve is held closed, completing the 24-Volt circuit through the Bryant automatic gas control.

If any pilot should go out, no current would be generated by the thermocouple; therefore, the 100% shutoff relay would close, stopping the flow of gas to all pilots and breaking the 24-Volt circuit to the automatic gas control.

D6 Gas Controls

The D6 gas control system consists of an automatic type gas valve, a thermopile, and a self-generating pilot burner.

The thermopile is fitted to the pilot burner. When the pilot flame impinges on the thermopile, it generates 750 millivolts of electricity. The gas valve has a small electromagnetically operated pilot valve which controls the gas pressure on top of the diaphragm. When this pilot valve is energized, it opens the bleed port and closes the gas supply port. With the bleed port

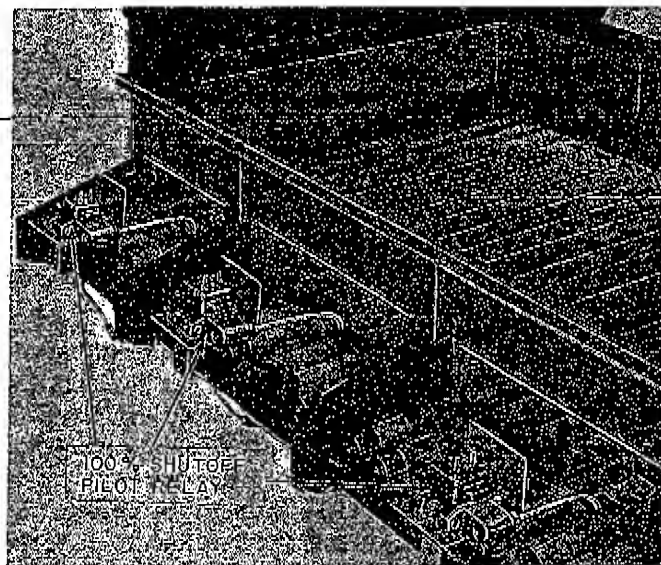


Figure 27

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open, the gas on top of the diaphragm is released. The gas pressure on the bottom of the diaphragm forces the diaphragm upward, opening the main valve.

The D6 gas controls are for a 750-millivolt self-generating system powered by a pilot burner-generator only. NEVER connect it to line voltage or to a transformer.

If the pilot should go out, no electric current would be generated by the thermopile; therefore, the automatic gas valve could not open.

Electric Limit Control

This control is furnished with water boilers, all gases. It will shutoff the gas supply to the main burners when the water temperature in the boiler reaches the Cut-Out setting. When the water temperature drops to the Cut-In temperature, the control allows gas flow to the burners. Cut-Out temperature is adjustable from 180 to 240° F. depending on the limit desired.

Gas Piping

Use a ground-joint-type union to connect the control assembly to the manifold header, then continue the piping to the main gas supply. Follow all local codes and ordinances. The following are pertinent recommendations. See Figure 28.

Joint compound (pipe dope) which is resistant to the action of propane should be applied sparingly and only to the male threads of the joints. Consult local supplier for type of compound to be used.

1. Run a separate gas line direct as possible from gas source to boiler. Size of pipe should be large as practical to minimize pressure loss (consult local utility). Pipe size should never be smaller than inlet to main manual gas shutoff valve supplied with boiler.
2. Mount main manual gas shutoff valve approximately 5 feet above floor level. A tapping for manual pilot gas shutoff valve should be on inlet (supply) side of valve. See Figure 27.
3. Connect gas control assembly to main supply line with ground joint union and tee.
4. Install drip leg from tee so it extends below control assembly.
5. Support supply pipe with adequate hangers or straps.

Connect the pilot supply tubing from the various pilots through the 100% pilot shutoff relay, if used, to the manual pilot gas shutoff valve.

The escapement tube from the Bryant automatic gas valve, or valve controller, should be installed on the pilot burner in the base closest to the control end of the boiler. The escapement tube is mounted to the top of the pilot mounting bracket with a clip and one screw. On boiler sizes 17 through 33, natural gas only, there are two escapement tubes; one each in the first two bases from the control end of the boiler. See Figure 29.

MAIN MANUAL GAS SHUTOFF VALVE
MAIN PILOT GAS SHUTOFF VALVE

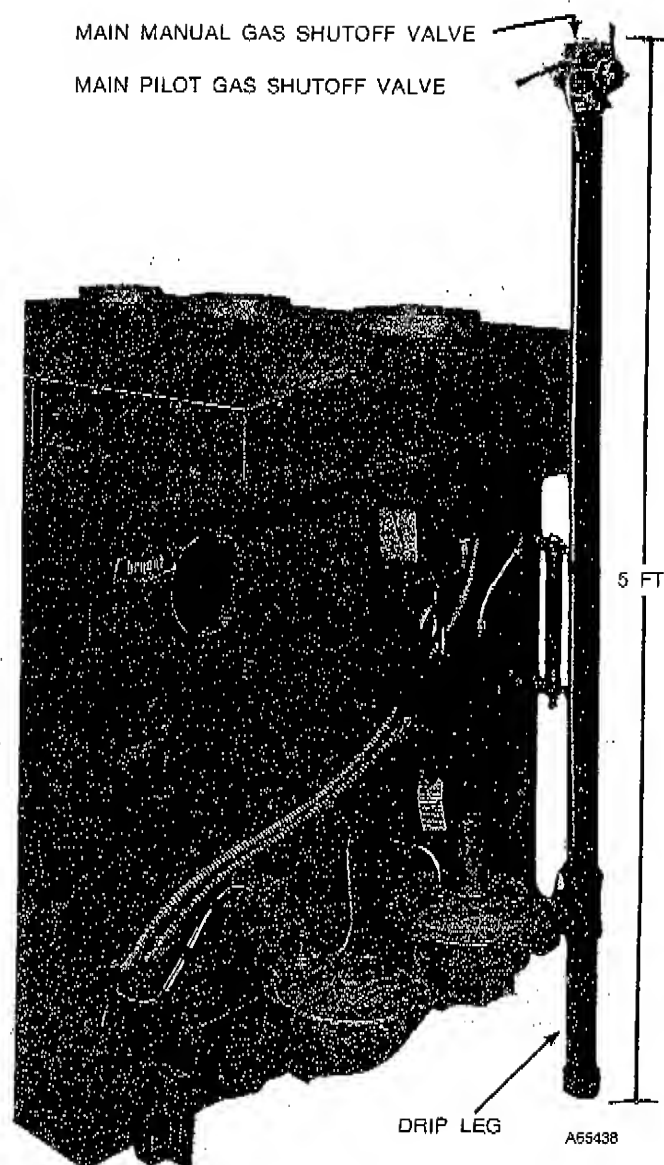


Figure 28

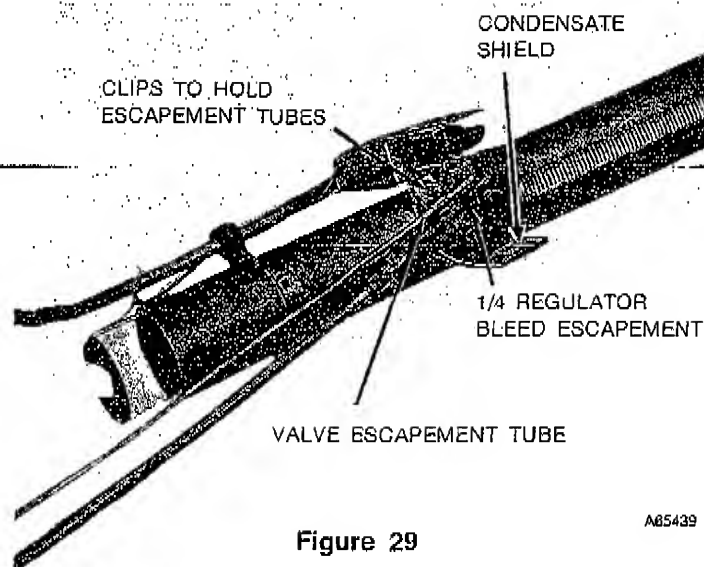


Figure 29

D4 (Natural) Steam and Water Non-100% Shutoff.
D2 (Propane) D5 (Natural) Steam and Water.
Thermocouple Pilot - 100% Shutoff.

On boilers with regulators larger than 1 inch, a 1/4-inch regulator escapement tube is required. This tube is also installed on the pilot mounting bracket in the base nearest the control end of the boiler. It is mounted with a clip in the same location as the diaphragm valve escapement tube.

A stainless shield is fastened under the escapement tube clamps and is folded over the top of the escapement tubes to prevent condensate from plugging the escapement orifices. The metal shield is shown in Figure 29.

IMPORTANT: After all connections have been made, check for leakage with a soap-and-water solution or in accordance with regulations of local utilities.

CAUTION: Never use a match or other open flame to check for gas leaks.

After all gas connections have been made and checked for leaks, the supply lines must be purged to eliminate trapped air.

It is recommended that the pilot supply tube be disconnected at the pilot shutoff valve on the boiler and the supply line allowed to purge until the odor of gas is detected. Immediately upon detecting a gas odor, shut off gas supply, reconnect the pilot supply tube. Wait 5 minutes, then proceed to light pilot as instructed on the rating plate.

ELECTRICAL WIRING

All electrical wiring should be in accordance with the National Electric Code and any local or gas company requirements which may apply.

All external wiring must be protected in accordance with local and national codes.

The wiring from the high-temperature limit must be fastened to the clips in the end panels. All wiring to the pilots and pilot relay *must be taped securely to the side of manifold opposite the batteries*. The wire furnished is a low-energy wire.

An NEC class 2 transformer supplied must be used in the control wiring of the Model 246 Boiler, except D6 millivolt natural gas controls. See wiring diagrams, Figures 34, 35, and 36.

If any of the original wire as supplied with the unit must be replaced, use type 105°C thermo-plastic wire or its equivalent.

FLUE CONNECTION AND VENTING

Consult local codes and gas company requirements. The following is standard practice for installing the flue pipe:

1. Consult dimensional drawing for number and size of flue pipes required for each size boiler. Also, consult appropriate table in A.G.A. Standards book for size of chimney connection.
2. Maintain minimum upward slope of 1/4 inch per linear foot from the boiler to chimney.
3. Run flue pipe directly as possible. Keep turns to a

minimum. Insert flue pipe into, but not beyond, inside wall of chimney.

4. Do not connect into a chimney serving an open fireplace.
5. Insulate flue pipe where it passes near combustible material.
6. Rigidly support pipe with hangers and straps.
7. Chimneys should extend at least 2 feet above any object within radius of 15 feet. This includes roof.
8. All flue pipes which extend through roof should be equipped with a hood.

In almost all locations, venting of a boiler relies on natural draft. Inasmuch as the energy available from natural draft is quite low, serious thought should be given to vent system design, i.e., adequate size, use of gradual transitions, tee's, elbows, etc., close proximity of boiler and chimney. On all boilers, the vertical risers must be at least as large as the vent openings on the draft hood.

A simple vent system consists of a 6 foot minimum vertical rise immediately off the draft hood, as shown in Figure 30. This vertical flue should terminate above the building roof with a suitable rain cap at least 2 feet above surrounding obstructions, i.e., parapets, adjacent buildings, penthouses, etc. This vent system applies to single draft hood boilers **ONLY**. It has limited practical use because of its restriction to single story boiler rooms and problems encountered in roof flashing.

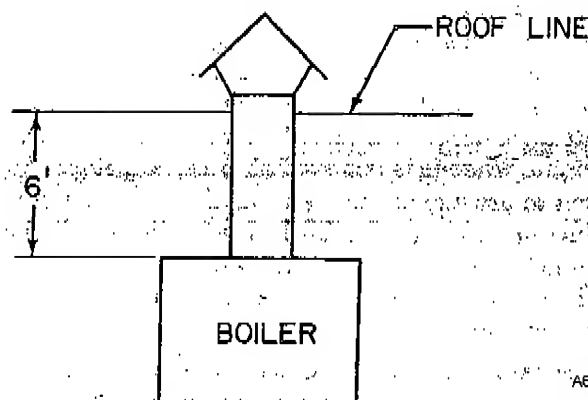


Figure 30

The above vertical venting system could not be used on multiple-base boilers because of the physical interference of multiple rain caps.

For multiple-base boilers, Figure 31, the pant-leg venting system shown could be applied if desired.

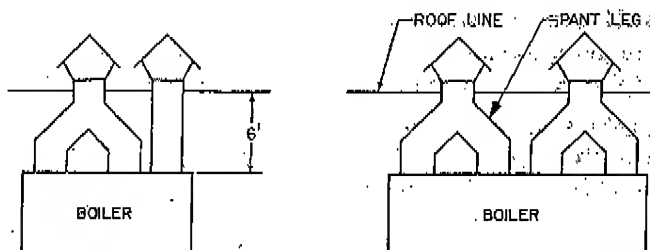


Figure 31

More generally used is a vent system as shown in Figure 32. Using the draft hood vent opening sizes shown in the boiler installation instructions, this system will work properly if a minimum vertical rise of 4 feet above the draft hood can be maintained. This is assuming that the chimney is of adequate size and also that adequate combustion air is available. Further, the outlet end of the horizontal collector should be no more than 6 feet from the chimney and should have no more than one 90° elbow in this six-foot run.

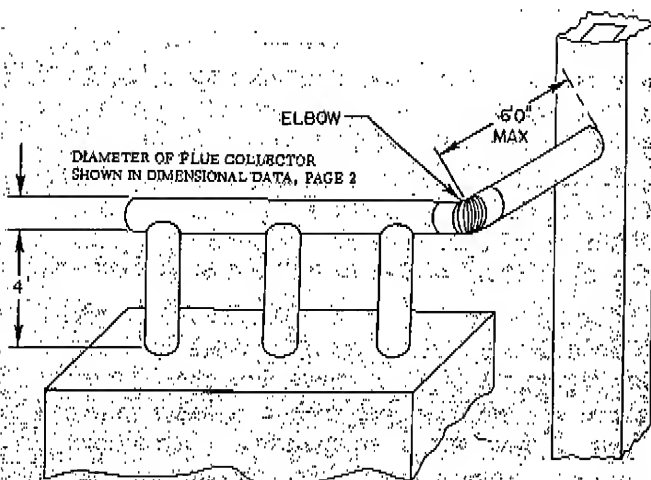


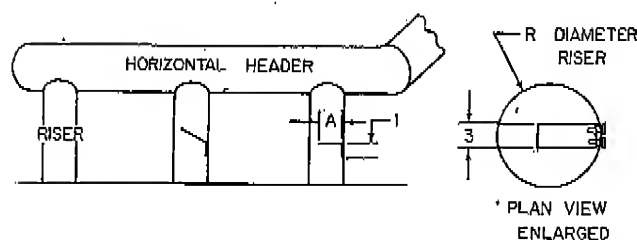
Figure 32

Practical application in many cases, however, will not allow adequate rise 4 feet above the boiler draft hood, and this is the installation where trouble occasionally develops. As this minimum of 4 feet is reduced, the ability of these risers to create a natural draft is reduced. This initial energy source is quite important. When it is not available, certain steps can be taken to provide proper venting. For each foot of riser reduction, enlarge the horizontal collector diameter one-inch. This will reduce the resistance of the system, and if the chimney is adequate, the unit should properly vent.

In certain cases where short risers, less than 4 feet high are a necessity due to overhead obstructions, spillage of combustion products has been noted at the draft hoods farthest from the chimney. Once again, assuming the chimney is adequate, an acceptable method of correction is to permanently baffle the riser(s) closest to the chimney to reduce the excess of room air entering those draft hoods. **DO NOT BAF-FLE ENOUGH TO CAUSE SPILLAGE.** The fixed baffles in the short risers above the boiler draft hood are acceptable as spelled out in Gas Appliances Gas Piping Z21.30. Size of Vent Connectors, and Dampers.

These baffles can be fabricated from 20-gauge steel such as shown in Figure 33. They should be permanently attached to the inside of the riser(s). Trial and error will dictate the degree to which each should be positioned to avoid draft hood spillage at the far end of the boiler. Be sure not to bend the fixed baffle

so it will obstruct the flue gas flow in the horizontal collector.



Baffle Size (Inches)

R	8	9	10
A	6	7	8

Shown is suggested size of fixed baffle for different size risers.

A65443

Figure 33

FIRING BOILER AND CONTROL ADJUSTMENT

After completing all gas and flue connections and water piping, the boiler is ready for operation and adjustments.

Before Lighting (all gases):

1. Make certain that boiler is properly filled with water.
2. Open all valves in supply and return mains of heating system.
3. Set thermostat or operating control below normal setting.
4. Close main manual gas shutoff valve and manual pilot gas shutoff valve for 5 minutes before lighting pilots.

Lighting D4 and D6 Pilots:

1. Open manual pilot gas shutoff valve and allow time for air to purge from line.
2. Light pilot(s) with a match or taper soon as air is purged.

Lighting D2 and D5 Pilots:

1. Open manual pilot gas shutoff valve.
2. Depress red button on 100% pilot shutoff valve and allow time for air to purge.
3. Light all pilots soon as air is purged.
4. Keep red button depressed until pilot flame is stable.

Gas Pressure Regulator

The adjustable, spring-loaded gas regulator ensures a constant gas pressure to the burners during main line gas pressure fluctuations. It is adjusted at the factory to deliver an outlet pressure of approximately 3 inches wc, assuming a range of inlet pressures up to 15 inches wc. While the boiler is in operation, check the gas input at the meter. The burners are equipped with fixed orifices sized to produce the rated input shown on the rating plate. Determine the gas input by following the method in Bryant form "Installation Procedures for Gas Appliances."

If the measured and rated input are not the same, the

gas pressure regulator may be adjusted as follows:

1. To increase input: Turn gas pressure regulator adjusting screw clockwise.
2. To decrease input: Turn adjusting screw counter-clockwise.

The manifold pressure for natural gas should be 3 inches wc.

NOTE: If measured input varies appreciably from rated input after the manifold pressure has been set, it is recommended that the orifices be changed. After changing the orifices again, check input and manifold pressure. Propane gas installations have a regulator installed at the supply tank. This regulator should be adjusted to give a manifold pressure of 11 inches wc.

Burner Adjustment, Primary Air:

1. Allow boiler to operate at least 15 minutes after input adjustment.
2. Adjust each burner flame by closing air shutter until a yellow tip appears; slowly open air shutter until yellow tip disappears from flame.
3. Lock shutter in this position with flat locking screw.

SERVICING

Flue Connections:

Inspect the flue connections to the chimney each year to make sure it is in good condition and has not become obstructed.

Draining Boilers:

Boilers should never be drained unless absolutely necessary. The water should remain in the boiler between heating seasons. When it is necessary to add makeup water, trapped air should be removed through the system vents. It has been found desirable under some conditions to keep the pilots lighted during the summer months to reduce surface corrosion.

Frequent addition of water can shorten the life of the boiler. If it is necessary to add water frequently, check the entire system and repair all leaks. If it is still necessary to add makeup water frequently, be sure the air is removed. The boiler water should be mildly alkaline with a pH of 7 to 8. Consult a local water treatment company for their recommendations.

Impurities in Boiler Water:

When a boiler is first installed and used for a few days, oil, grease, and sediment from pipe fittings may collect within the boiler. These impurities may cause foaming and an unsteady water line. They may prevent steam generation in a steam boiler and may result in objectionable odors escaping from the vents on water boilers. This condition can be remedied only by giving the boiler a thorough cleaning.

CAUTION: Check the boiler water level. Never risk lighting the pilots or main burners under a dry boiler.

Relief Valve - Care and Maintenance

Manually trip relief valve once a month to assure

proper opening and seating of valve. If continually leaking, never plug - call for service.

CLEANING STEAM BOILERS

Caution: The boiler should not be left unattended during the clean-out process.

1. Skimming off Impurities

Some of the impurities in the boiler water will float on the water and must be skimmed off. Run a temporary connection from the skimmer tee to a suitable drain.

With the boiler empty and cool, slowly begin to add water. After water has entered boiler, never before, turn "on" main gas burners and adjust flame at main manual shutoff valve so that the water being added is kept just below boiling point. Avoid boiling and turbulence.

Gradually raise hot water level to tee, being careful not to raise it above the opening in the tee. Skim until there is no trace of impurities. Repeat process if necessary.

Water may be checked to make sure it is free from oil by drawing off a sample at the skimming tee. If the sample is reasonably free from oil, it will not froth when boiled on a stove. This test does not indicate the amount of sediment which may lay in the bottom of the boiler. It is therefore necessary that the boiler be further cleaned by "blowing down".

2. "Blowing Down" Boiler

Before "blowing down" the boiler, fill it to the water line. Light burners and allow 5 pounds of steam pressure to build up. Run a temporary connection from one of the drain valves to a nearby sewer. Connect to a drain valve on the opposite end of the boiler from the feed water inlet, if possible. Shut off the gas burners and inlet water, open drain valve, and "blow down" entire contents of boiler.

Allow boiler to thoroughly cool and slowly refill to water line. Repeat Step 2 as many times as required until "blow-off" water is clear.

Using Cleaning Compound

If an exceptional amount of dirt or sludge seems to be present in the boiler, a boiler-cleaning-compound made by a reputable manufacturer may be used according to the instructions of the manufacturer of the compound. When any type of cleaning compound is used, care must be taken to thoroughly flush all traces of the compound out of the boiler.

Sal Soda (washing soda) is sometimes used for exceptionally dirty boilers, but its use requires extreme caution. The boiler can be seriously harmed if the soda is not thoroughly washed out so that the water does not exceed a pH value of 7 to 8. Soda is difficult to remove and requires a lengthy process of repeatedly flushing the boiler to assure complete removal.

If soda is insisted upon, it is recommended that a solution of one pound, dissolved in a pail of hot water,

be prepared for each 10 gallons of boiler water. (Check water capacity of boiler). Pour the solution in any convenient opening at, or above, the flow tapping. Fill boiler to flow tapping and adjust fire manually to maintain simmering for 5 or 6 hours. Increase fire to build up 5-pounds pressure and "blow down" boiler.

"Blow down" boiler again as in Step 2, then flush continuously until it is certain that boiler is free of the soda. After the boiler has been thoroughly cleaned, add fresh, clear water to the proper level in the heating system. The degree of acidity or alkaline should not exceed a pH value of 7 to 8.

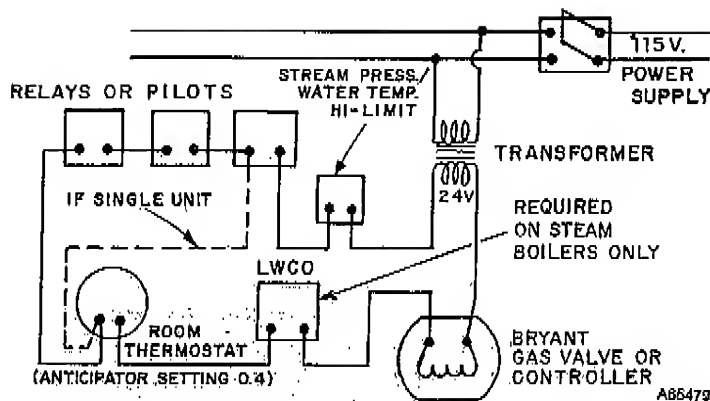
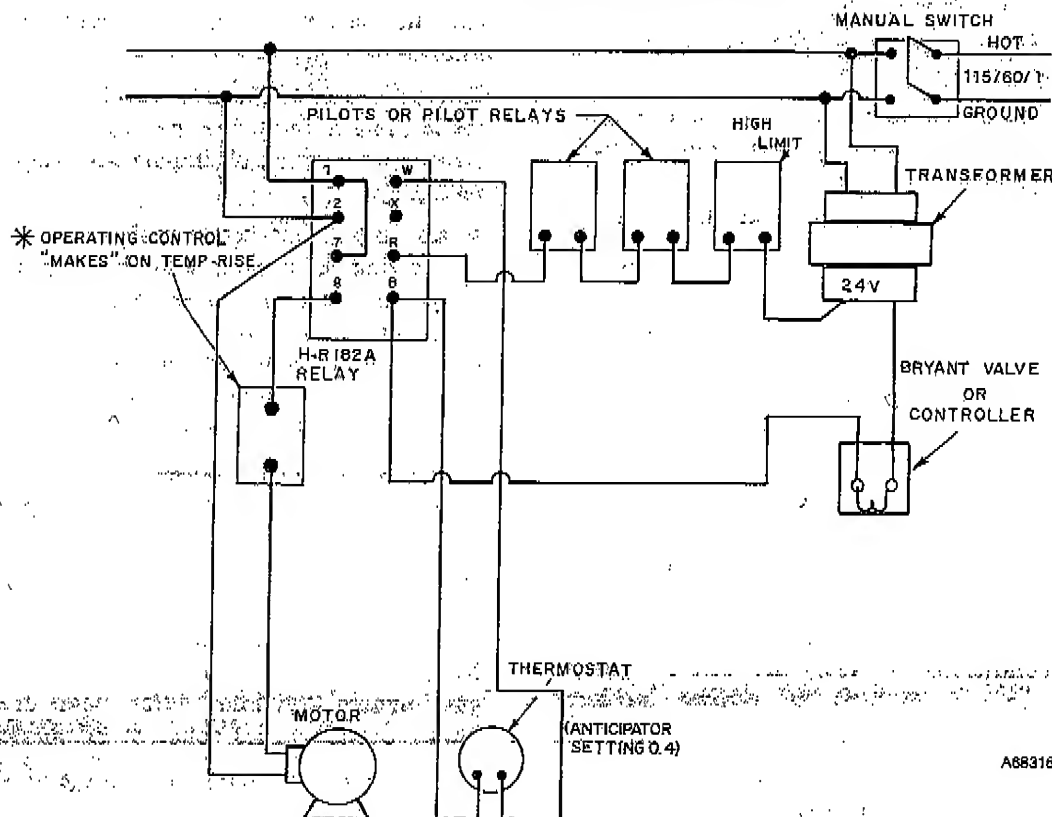


Figure 34 - D4 (Natural) Steam and Water Non-100% Shutoff - D2 (Propane) and D5 (Natural) Steam and Water-100% Shutoff.



FORCED WATER CIRCULATION FOR 246 BOILER

*CONTROL SHOULD BE LOCATED IN TAPPING "G" (SEE PAGE 6) END SECTION OPPOSITE FROM LIMIT CONTROL AND THE TEMP-ALT-GAUGE INSTALLED IN THE TOP "E" TAPPING.

Figure 35

CLEANING THE BOILER

The flue passages between sections should be examined yearly and cleaned as required.

1. Turn off electrical power supply and gas supply to boiler.
2. Remove front casing panel(s).
3. Remove burner doors and burners.
4. Remove top cover from draft hood(s).
5. Clean flue passages between sections with a wire flue brush.
6. Clean out the bottom of boiler.
7. Reassemble boiler by reversing above steps.

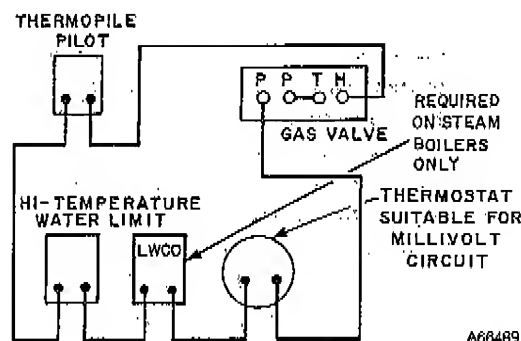


Figure 36 - D-6 Controls 4, 5, & 6 sizes only (Millivolt, Thermopile pilot, —Nat. gas)